

CORRESPONDENCE

A new species of Chresmodidae from Mid-Cretaceous amber discovered in Myanmar

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Abstract The extinct new species, *Chresmoda chikuni* Zhang & Ge, **sp. nov.** is described from the Mid-Cretaceous amber from northern Myanmar. This amber insect exhibits a very peculiar combination of derived characters like strongly elongated, free coxa, non-clawed pretarsus. The type specimens are deposited in the Three Gorges Entomological Museum, Chongqing, China.

Key words Amber, new species, Chresmodidae, Myanmar, Cretaceous.

1 Introduction

The extinct insect family Chresmodidae is based on large fossils with a waterstrider-like habitus. These insects have short antennae and orthognathous chewing mouthparts with strong mandibles, and large compound eyes. The legs are extremely prolonged with long femora, shorter tibiae, and long, multi-segmented, flagellate tarsi (Delclòs *et al.*, 2008). The first species, *Chresmoda obscura*, was erected by Germar (1839). The family has been found in Eurasian Region and Brazil, from the Upper Jurassic to the Upper Cretaceous (Grimaldi & Engel, 2005; Nel *et al.*, 2005). Debates on its taxonomic status have never stopped ever since its finding, ranging from Hemiptera, Mantodea, Phasmatodea and Polyneoptera (Martínez-Delclòs, 1989; Carpenter, 1992; Rasnitsyn & Quicke, 2002; Grimaldi & Engel, 2005). It is known that nymphs and males are apterous, but females have four wings with possible flight capability (Nel *et al.*, 2005). Chresmodids are supposed to be aquatic insects, probably carnivorous (Baudoin, 1980; Nel *et al.*, 2004, 2005). In this family, tarsi possess an extraordinary structure, so called ultraarticulated tarsi, which are probably associated with their capability of skating on water-surface (Nel *et al.*, 2004, 2005; Zhang *et al.*, 2008a, b, 2010).

This family is still an enigma to date. Recently, we collected two well-preserved chresmodids amber for the first time in Mid-Cretaceous deposits of northern Myanmar, often referred to as Burmese amber before. Based on their morphological characters, we erect a new species, *Chresmoda chikuni* Zhang & Ge, **sp. nov.** by describing two female specimens.

2 Materials and methods

The type specimens are deposited in the Three Gorges Entomological Museum, Chongqing (specimen available for study by contacting GSQ or WWZ).

Habit photos of the amber were taken with a Canon 7D camera connected to the stereoscope (Olympus SZX2 TR30). Final figures were aligned with Helicon Focus 6® and prepared with Adobe Photoshop CS6® and Adobe Illustrator CS6®.

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Terminology used follows Delclòs *et al.* (2008).

3 Systematic paleontology

Family Chresmodidae Handlirsch, 1908

Type genus: *Chresmoda* Germar, 1839

Genus *Chresmoda* Germar, 1839

Chresmoda Germar, 1839: 68. Type species: *Chresmoda obscura* Germar, 1839 (Upper Jurassic, Tithonian, Solnhofen, Germany).

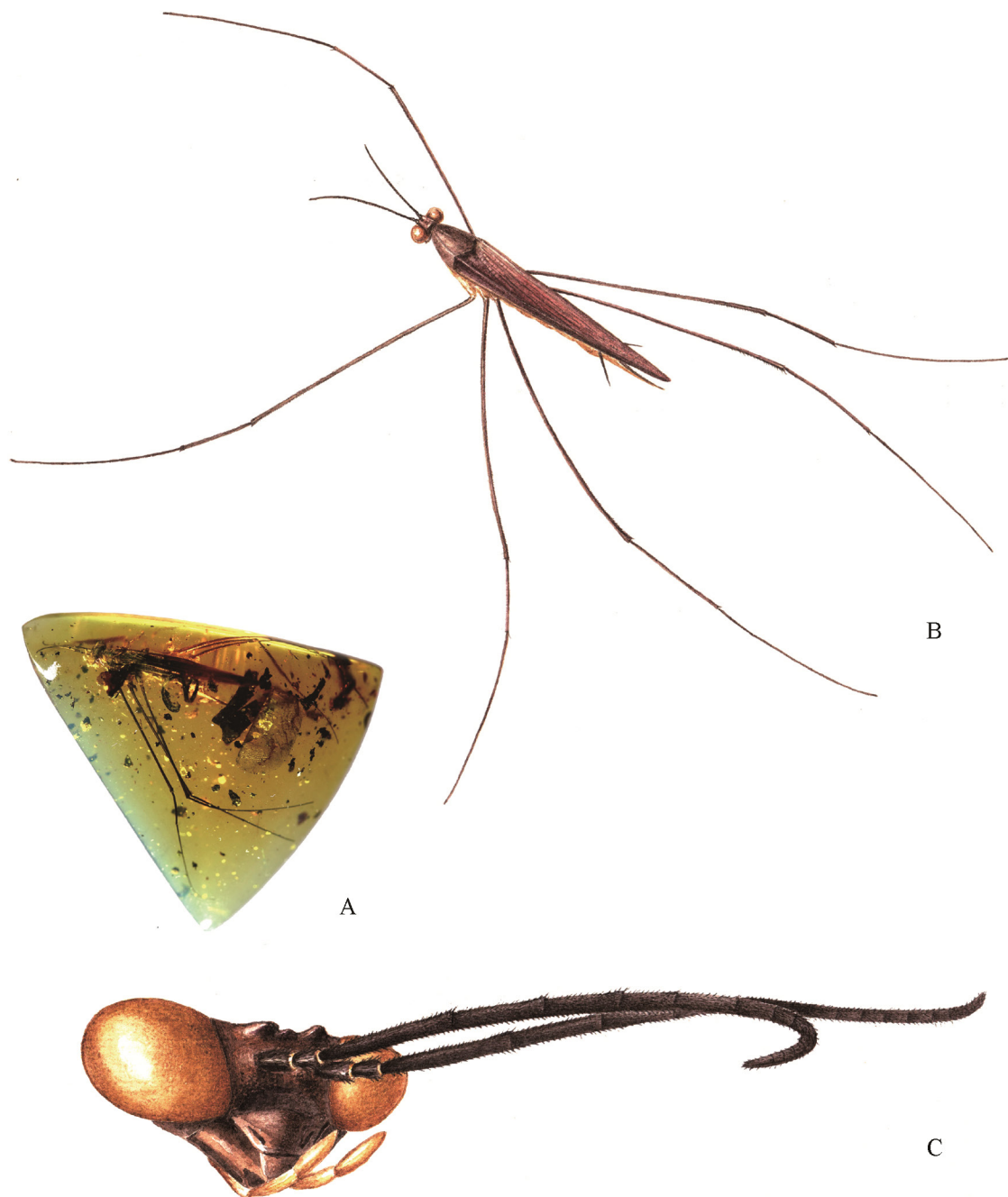


Figure 1. *Chresmoda chikuni* Zhang & Ge, **sp. nov.** A. Origin amber. B. Habitus, dorsal view. C. Head, lateral view.

***Chresmoda chikuni* Zhang & Ge, sp. nov.** (Figs 1–3)

Material examined. Holotype. Female, BU-002027, Albian-Cenomanian boundary, Hukawng Valley, Northern Myanmar. Paratype. 1 female, BU-001010, same data as holotype.

Etymology. The specific name is after the late Chinese famous entomologist, Prof. Chikun Yang.

Diagnosis. Head small. Female has wings. Scape of antennae expanded slightly in female. The first segment of the flagellum is elongated. Legs are long and narrow with similar shape; mid leg femora are the longest. Coxae on the same side of thorax are far apart from each other.

Description. Size large, wings exceeding length of the abdomen. Head small, broadly pressed. Antennae filiform, distinctly segmented, with more than 18 segments, 15.7 mm long, shorter than length of fore femora. Antennae covered with short setae. Mouthpart covered and orthognathous; maxillary palpi four segmented and distinguished. Compound eyes obvious.

Thorax longer than width, with clear sides and vertices, sides with smooth margin. Notum clear, while sterna of thorax well preserved.

Prothorax short, tightly connected with head. Mesothorax slightly elongated, gradually broadened, somewhat trapezoidal, longer than prothorax and metathorax. Lengths of prothorax : mesothorax : metathorax approximately 3.0 mm : 5.6 mm : 3.3 mm. All legs with same shape, long and narrow, covered with dense short hairs. Coxae robust. Pairs of coxae widely separated, all similar; those on same side of thorax apart from each other. Parts of legs not preserved. Mid-femora long (32.5 mm), fore-femora (28.8 mm). Fore-tibiae (17.1 mm), elongated and extended, represent approximately 59% of length of femur. Mid-tibiae 25.1 mm long. Mid legs probably longest. Hairs and setae along legs obvious and well preserved. Hairs and setae along legs, some prominent long fringing hairs on parts of mid leg tibiae. These hairs somewhat similar to those on legs of extant water-strider, *Gerris* (Hemiptera), probably associated with effective skiing on water surface by new species. The multi-segmented tarsi clearly preserved. Incumbent wings, exceeding length of the abdomen, longer than 37.2 mm. Due to folding and overlapping, most venations unavailable. Few longitudinal veins observed faintly, but seem to

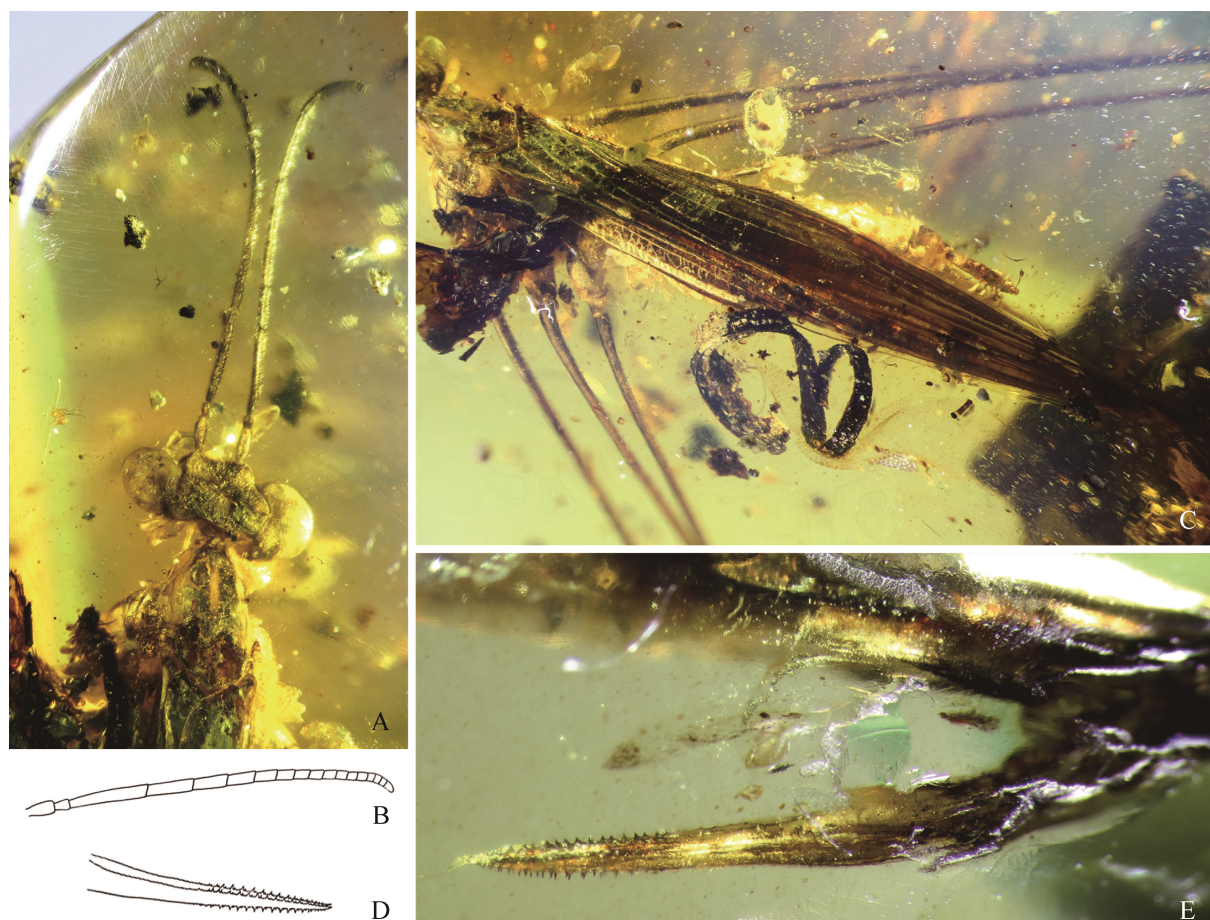


Figure 2. *Chresmoda chikuni* Zhang & Ge, sp. nov. A. Head. B. Antenna. C. Wings. D–E. Ovipositor.

remain parallel to the margin. Cross veins invisible. Abdomen, with eight visible segments, pressed apart; with a prominent orthopterod ovipositor, which long and strong, sword-like, apical part with dense setae.

Remarks. The amber fossil *Chresmoda chikuni* Zhang & Ge, **sp. nov.** present some distinct characters which could not examined clearly in stone fossils. The head orientation is hypognathous; the maxillary palpi and labial palpi are four-segmented. The setae of tibia and tarsus are quite clear and can be counted easily. All of these could give more detailed morphological information for the future study.

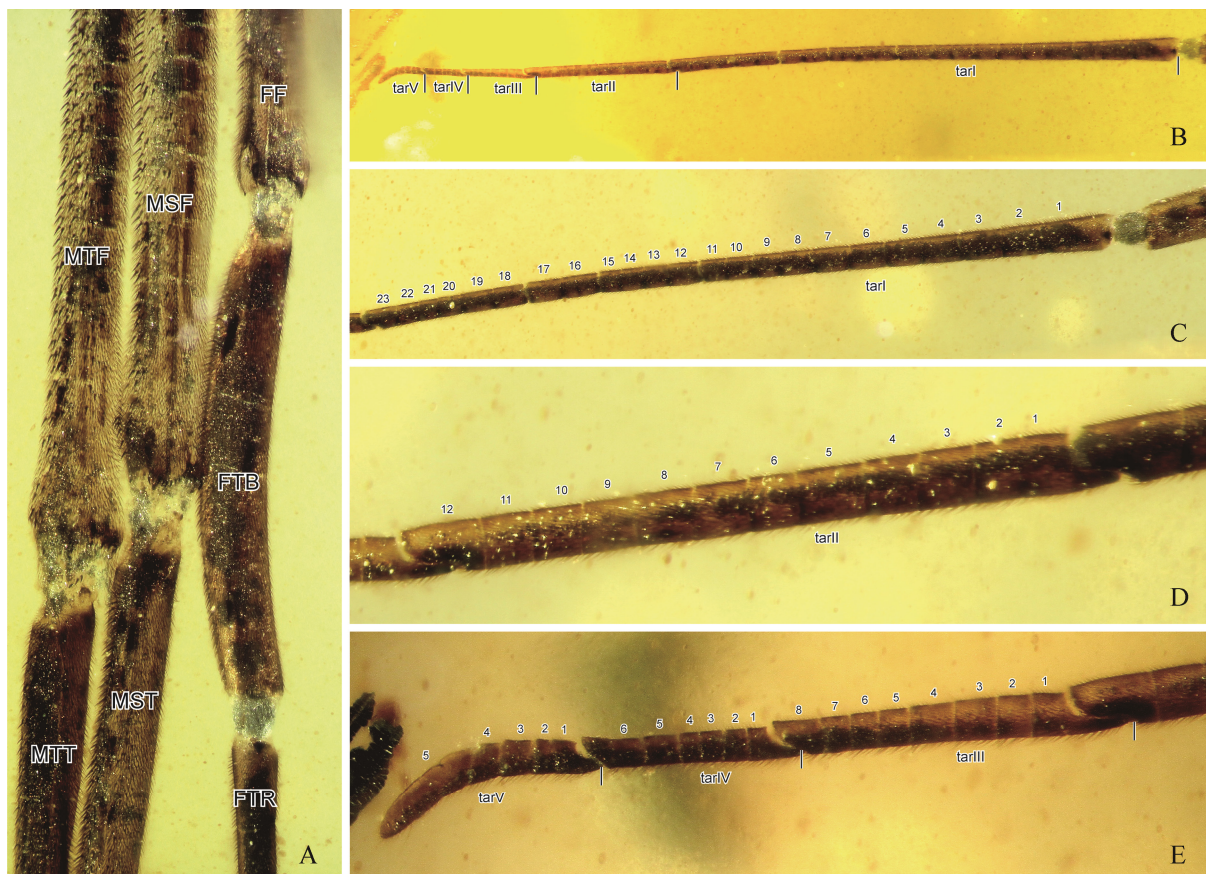


Figure 3. *Chresmoda chikuni* Zhang & Ge, **sp. nov.** A. Legs. B. Fore-tarsus. C. First tarsomere. D. Second tarsomere. E. Third, fourth and fifth tarsomeres.

4 Discussion

Chresmoda species is different from Mantodea. In the antennae of mantises, the third antennomere is the longest, which is equal in length in *Chresmoda*. In most mantises, the pronotum is elongate, with a central sulcus, different from the more or less rounded pronotum of *Chresmoda*. However, a short pronotum is still present in basal extant mantid taxa like *Chaetessa*, *Mantoida* and *Metallyticus*. As in *Chresmoda* that had more prominent stiff, stout hairs (or spines) on the rear of the legs, mantids have evident spines in the same position. On the other hand, *Chresmoda* is different from Phasmatodea. However, the trochanter of Euphasmatodea is considerably smaller than that of Chresmodidae, which is usually fused to the femur, and can be autotomized at its boundary. As comparison with Orthoptera, *Chresmoda* shares with the Orthoptera by their long, tripartite ovipositor (composed of two valvulae and the valve-like gonoplac). The relatively short antenna of *Chresmoda* could be an adaptation to aquatic environments. In Orthoptera, the scape and pedicel segments of antennae are larger than the flagellar segments, whereas the pedicel is the shortest article in *Chresmoda*, *Macropterous*, *Brachypterous*, or apterous taxa are known in Orthoptera, as in *Chresmoda*. Orthopteran ovipositors show denticulate inferior valvulae, as in *Chresmoda*. In addition, the robust metacoxae meeting at the midline of the sternum in *Chresmoda* are typical for Orthoptera, which usually have small, well-separated metacoxae. However, the systematic position of Chresmodidae still require more detailed morphological study and phylogenetic analysis with other orders by conducting morphological characters.

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